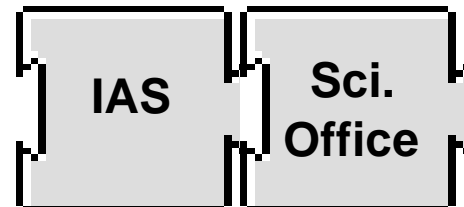
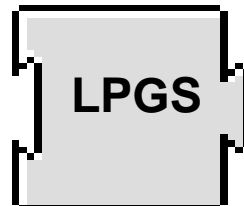
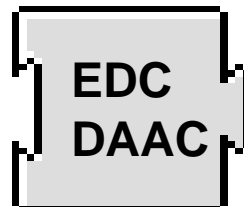
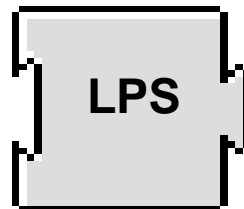




**DAAC Emergency System
Quaterly Management Meeting - 2 (R1)
Presentation
By
Robert Schweiss
May 14, 1997**





Statement of Problem and Boundary Conditions

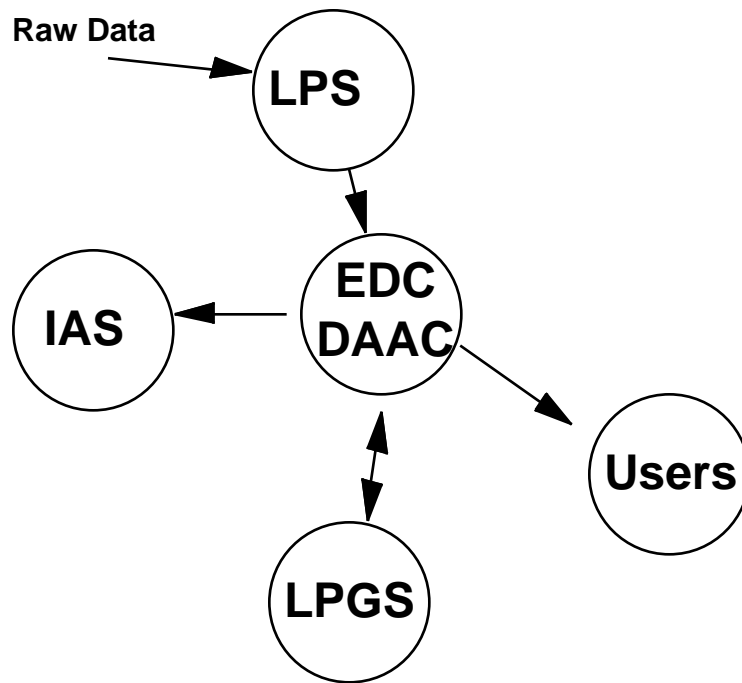


Statement of Problem

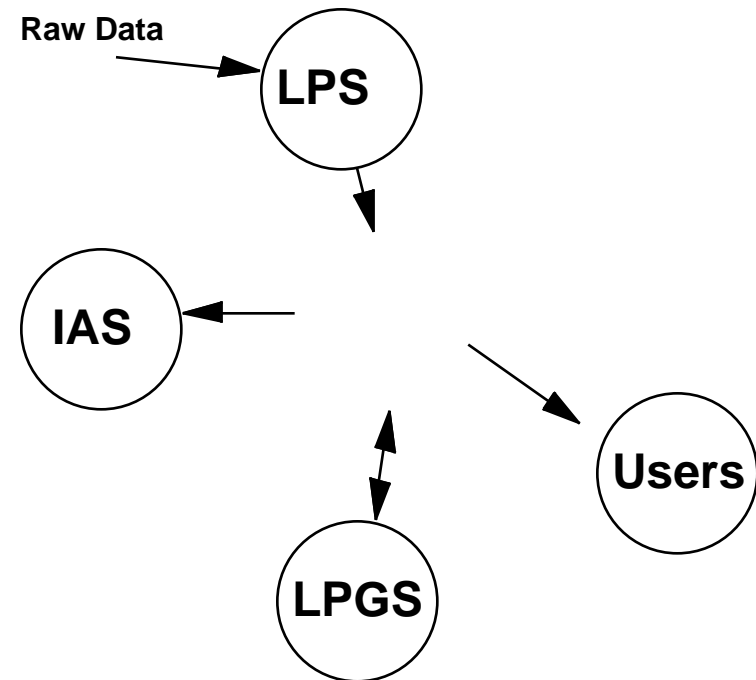
Statement of Problem:

How will L7 compensate if EDC DAAC is not available at launch?

Baseline



Problem Condition





Boundary Conditions

- **LPS, IAS, and LPGS are only systems to be impacted**
- **Budget - \$2M**
- **L7 Science Office will initially receive DES Output**
- **L0R data is to be stored**
- **Support initial L7 operations activities (i.e. ETM+ Calibration)**



Proposed Solution



Develop a DAAC Emergency System (DES) that emulates five basic functions of the EDC DAAC:

- **Metadata and Browse selection and data request by users (i.e. Science Office)**
- **WRS Scene subsetting**
- **HDF Conversion (From HDF EOS to HDF)**
- **Format 1 and Format 2 Merging**
- **Tape Generation of both L0R and L1R data sets**

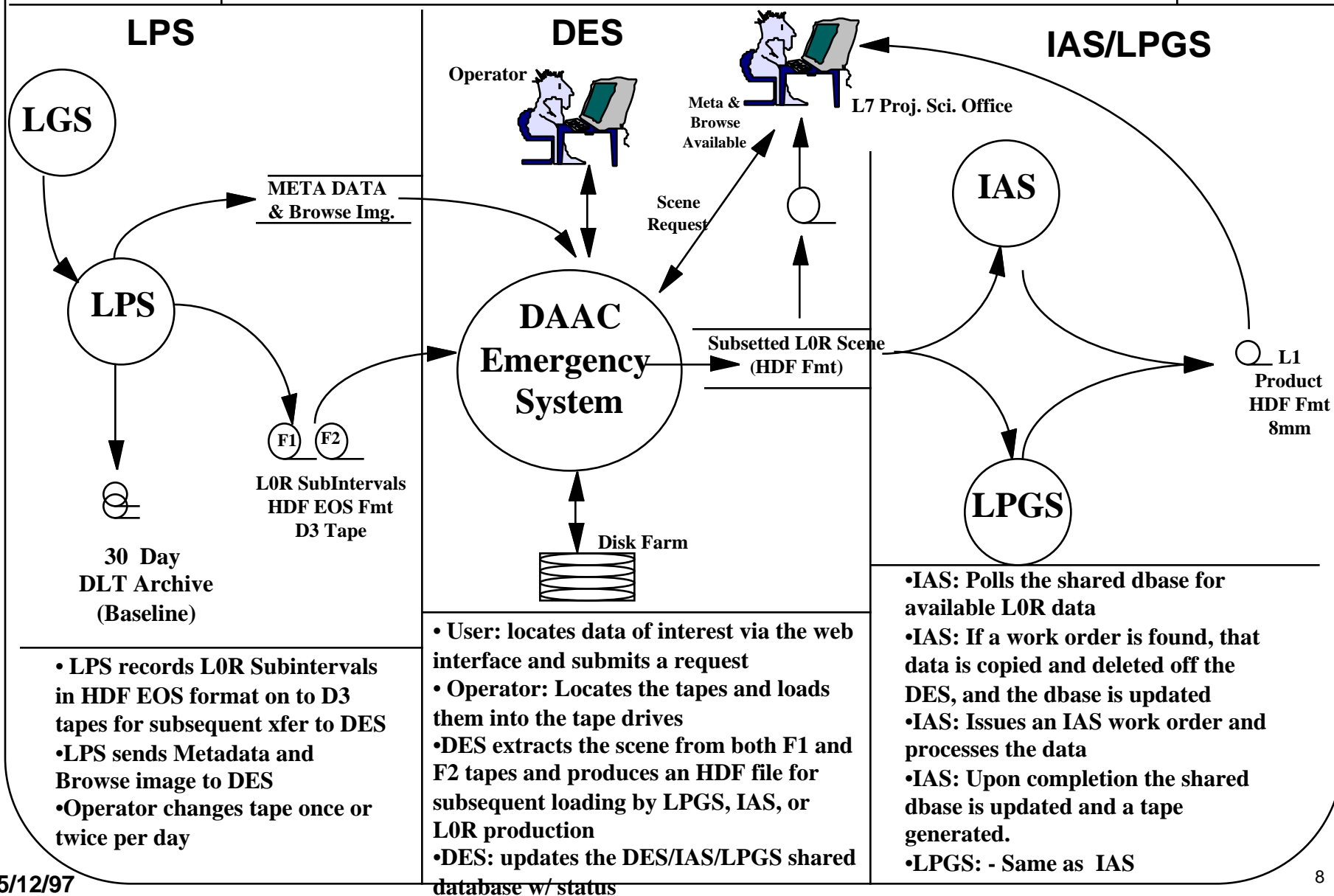


Assumptions

- **System is Required for Launch**
- **Customer is L7 Science Office (i.e. no cost accounting)**
- **Output Files of the Emergency System are in HDF File format**
- **Science Office to provide WRS Path & Row, scene acquisition Time, and/or cloud cover criteria when requesting data**
- **EDC DAAC to operate system**
- **O&M costs not included**
- **Shipping costs between EDC and GSFC not included**

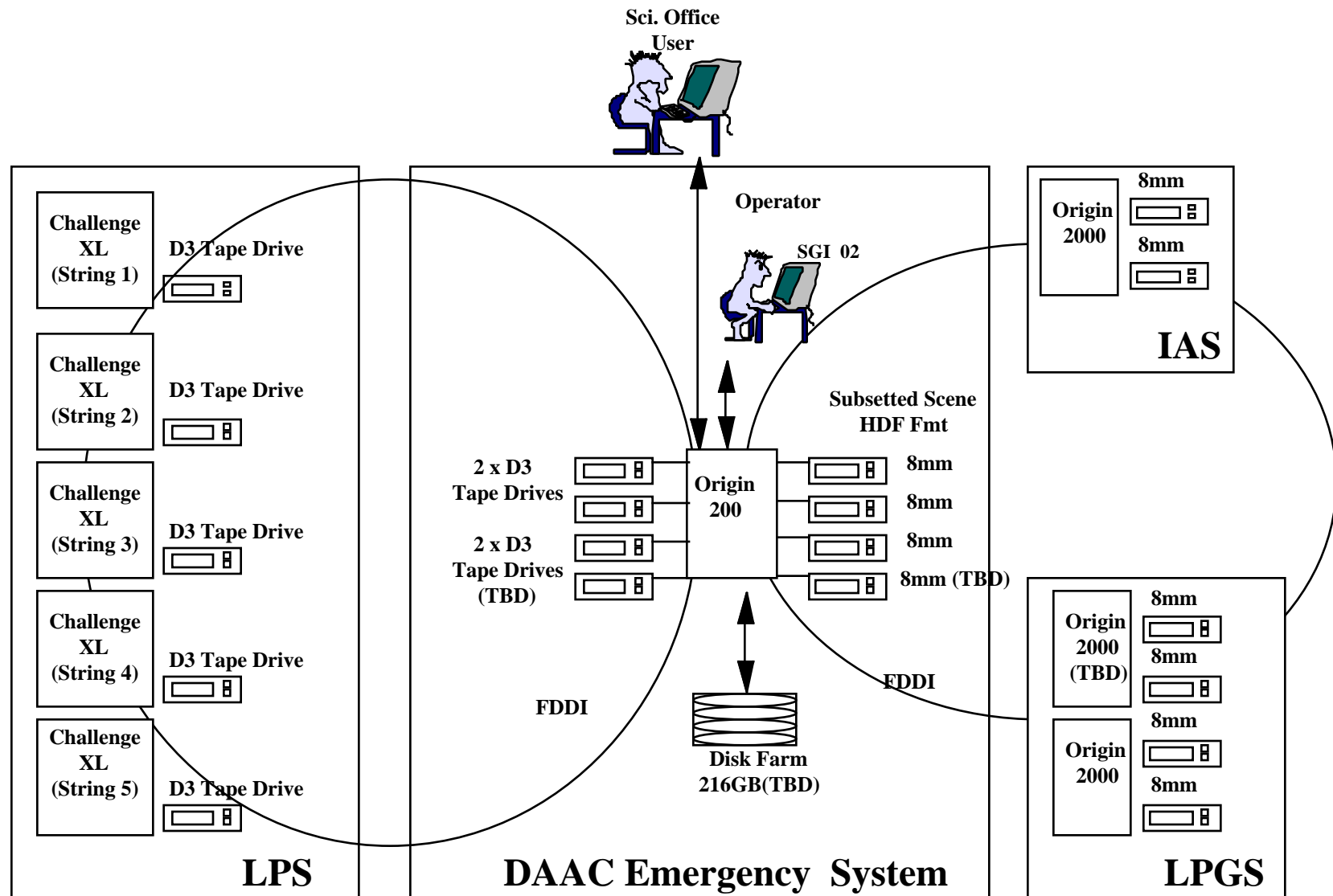


Basic Data Flow Diagram





Hardware Diagram





Merits/Demerits

Merits

- + **Minimizes impact on IAS, LPS, LPGS**
- + **All data from Spacecraft is being captured and processed to L0R format and retained**
- + **End to end data tracking**
- + **D3 Tapes substantially simplify DAAC catch-up subsequent to its arrival**
- + **D3 Tape drives are reusable by the EDC DAAC**
- + **Simple / Low Risk**

Demerits

- **No Data Distribution (Release B.0 work around)**
- **No General User Distribution currently planned**
- **Operator Intensive**



Risks

•SGI Origin 200 Aggregate Tape read speed (Assuming 4 drives)

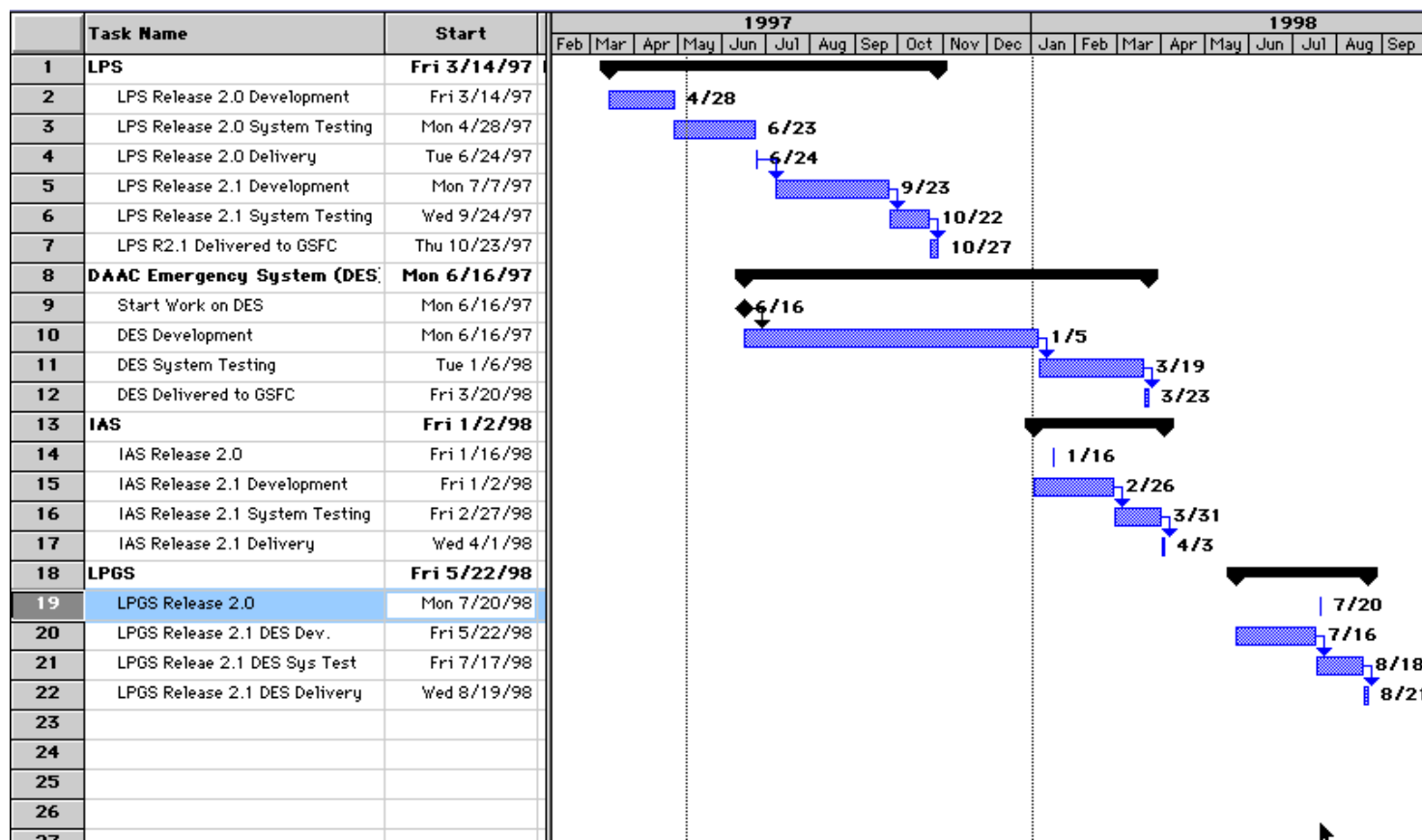
	Performance	Throughput
Worst Case	12 MBps	64 scene per day
Expected	24 MBps	96 scenes per day
Ideal Case	44 MBps	196 scene per day

•Mitigation: Benchmark Redwood D3 tape drives early



Schedule

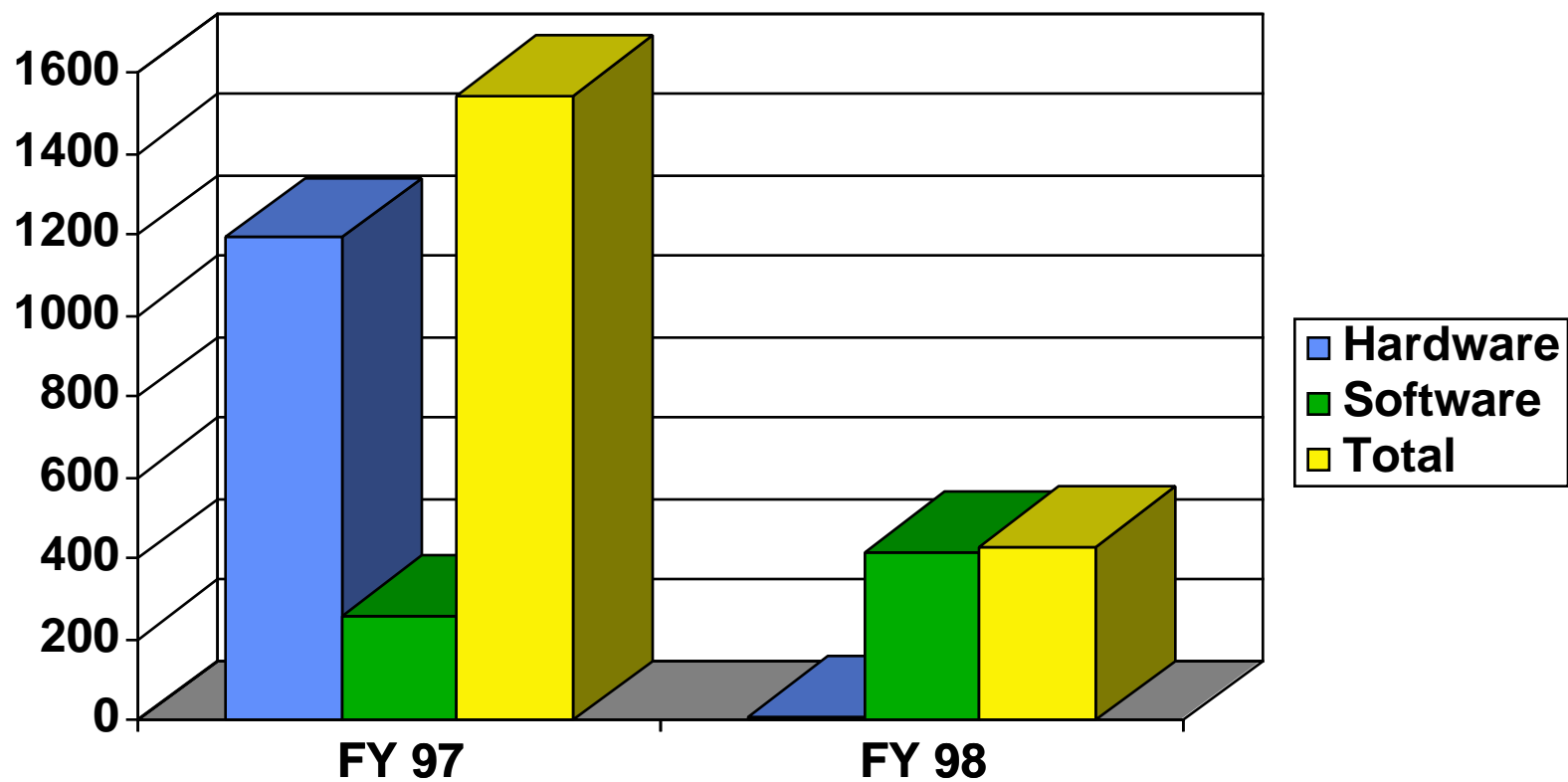
Schedule





Cost

Cost





Support for Landsat 7 Functionality in ECS Release B Mapping



Receiving and Archiving Data

Function	B.0'	B.0	B.1	DES
LPS Electronic Data Transfer	●	●	●	○
L70R (band files, calibration shutter data, payload correction data, mirror scan correction data), Browse and Metadata Ingest and Archive	●	●	●	○
Granule Versioning	● ₁	● ₁	●	×
IAS Data Transfer (calibration parameter files)	●	●	●	×
IAS Data Ingest	●	●	●	×
Metadata Updates	●	●	●	×
Re-processed Data Ingest and Archive	●	●	●	×
IGS Data Transfer	×	×	●	×
Document Ingest and Archive	×	○ ₂	●	×

× – not supported; ○ – partially supported; ● – fully supported

1 – granule version label identification; 2 – document scanner and Web server

**Data Search and Access**

Function	B.0'	B.0	B.1	DES
Core Metadata Search (geographic location, acquisition time, quality)	●	●	●	○
Product-specific Attribute Search (WRS path and row, instrument mode, sensor gain settings, cloud cover, sun elevation angle)	×	●	●	×
Browse	○ ₃	●	●	○
WRS-scene Subsetting	●	●	●	●
Multi-file Granule Distribution (L70R)	●	●	●	?
Multi-granule Product Distribution (L70R with calibration parameter files)	○ ₄	○ ₄	●	?
Floating Scene Subsetting	×	×	●	×
Band Subsetting	×	×	●	×
Electronic Distribution	●	●	●	×
Media Distribution	○ ₅	●	●	○
Document Distribution	×	○ ₆	●	×

× – not supported; ○ – partially supported; ● – fully supported

3 – non-integrated browse; 4 – granules ordered separately; 5 – manual; 6 – Web server



Fulfilling Product Orders

Function	B.0'	B.0	B.1	DES
Basic Product Order	●	●	●	×
Product Order with Subset Specifications	○ ₇	○ ₇	●	×
Price Estimates	×	○ ₈	●	×
End-user Order Modification	○ ₉	○ ₉	●	×
Order Status for End-users	○ _{9, 10}	○ ₉	●	×

× – not supported; ○ – partially supported; ● – fully supported
 7 – WRS-scene only; 8 – static pricing for scenes; 9 – order-level only;
 10 – operator intervention required

Data Processing

Function	B.0'	B.0	B.1	DES
Level 1 Product Ordering and Distribution	×	×	●	○

× – not supported; ○ – partially supported; ● – fully supported

**User Services**

Function	B.0'	B.0	B.1	DES
End-user Profile Management	○ ₁₀	●	●	×
End-user Account Access	○ ₁₀	○ ₁₀	●	×
End-user Trouble Tickets	○ ₁₀	○ ₁₀	●	×

× – not supported; ○ – partially supported; ● – fully supported; 10 – operator assistance required

Billing and Accounting

Function	B.0'	B.0	B.1	DES
General Billing and Accounting Functions (invoice generation, accounts management, payment management)	○ ₁₁	○ ₁₁	●	×
Landsat Billing Algorithms	○ _{11, 12}	○ _{11, 12}	●	×
Landsat Funds Management	○ ₁₁	○ ₁₁	?	×
Billing and Accounting Queries	○ ₁₁	○ ₁₁	●	×

× – not supported; ○ – partially supported; ● – fully supported

11 – Assumes EDC billing and accounting support; 12 – WRS-scene only

System Management

Function	B.0'	B.0	B.1	DES
Archive Management Reports to MOC	○ ₁₃	○ ₁₃	●	×
System Reports to MMO	○ ₁₃	○ ₁₃	●	○ ₁₄

× – not supported; ○ – partially supported; ● – fully supported; 13 – manual report definition; 14 – manual report capabilities are possible



24 Hour Throughput Model

Throughput Model



24 Hour Throughput Model (Serial)

LPS Generate Tape	DES Load Pair of Tapes (Load)	DES locate and extract scene (Process)
$8\text{GB} / 11\text{MB/s} = 728\text{sec}$ $728 / 60\text{sec/min} = 12.12 \text{ min}$	Seek to data on Tape: 2 min Load data $8\text{GB} / 11\text{MB/s} = 728\text{sec}$ $728 / 60\text{sec/min} = 12.12 \text{ min}$	Educated Guess: 30 minutes (serial) 45 minutes (2 parallel)

Scenes/Day

F1	Ops	Seek	Load	Process	Ops	Seek	Load	Process
	10 min	2 min	13 min	30 min	10 min	2 min	13 min	30 min
F2	Ops	Seek	Load	Process	Ops	Seek	Load	Process
	10 min	2 min	13 min	30 min	10 min	2 min	13 min	30 min

Expected Throughput: 26

Bottle Neck is the Process Step @ 30 min per Scene



24 Hour Throughput Model (Parallel)

LPS Generate Tape	DES Load Pair of Tapes (Load)	DES locate and extract scene (Process)
$8\text{GB} / 11\text{MB/s} = 728\text{sec}$ $728 / 60\text{sec/min} = 12.12 \text{ min}$	Seek to data on Tape: 2 min Load data $8\text{GB} / 11 \text{ MB/s} = 728\text{sec}$ $728 / 60\text{sec/min} = 12.12 \text{ min}$	Educated Guess: 30 minutes (sequential) 45 minutes (2 parallel)

Scenes/Day

F1	Ops	Seek	Load	Process	
	<u>10 min</u>	<u>2 min</u>	<u>13 min</u>	<u>45 min</u>	
F2	Ops	Seek	Load	Process	
	<u>10 min</u>	<u>2 min</u>	<u>13 min</u>	<u>45 min</u>	
F1		Ops	Seek	Load	Process
		<u>10 min</u>	<u>2 min</u>	<u>13 min</u>	<u>45 min</u>
F2		Ops	Seek	Load	Process
		<u>10 min</u>	<u>2 min</u>	<u>13 min</u>	<u>45 min</u>

Expected Throughput: 64

Bottle Neck the Processing step @ 45 min per Scene



Where do we go from here?

Where do we go from here?

- **Prototype and bench mark D3 drives**
- **Develop Implementation milestones and generate staffing profile**
- **Procure hardware**
- **Begin Examination of Potential Interface with DAAC B.0 Billing / Accounting work around**
- **Begin Examination of Distribution Capabilities at EDC**



Backup Slides

Backup Slides



Operational Scenarios

Operational Scenarios



- **LPS to Save HDF EOS L0R Files to Tape and send browse and meta to DES**
- **DES to locate, ingest, extract, and merge HDF L0Rwrs files**
- **IAS or LPGS to load L0Rwrs file and produce L1 Files**



LPS to Save HDF EOS L0R Files to Tape and send browse and meta to DES

LPS : After L0R Processing save L0R subinterval to D3 tape

LPS : Extract Metadata and Browse images

LPS : Update internal accounting records for data produced

LPS : Send Metadata and Browse images to DES

**Operator: If this is the last contact of the day then extract D3 tape, insert
new tape, and update tape sequence number**

**DES to locate, ingest, extract, and merge HDF L0Rwrs files**

Science Office: Identify the scenes to be processed

DES : Display tape sequence number to operator

Operator : Load tape specified by DES

Operator : Initiate Scene extraction Process

DES : Stage the required subinterval data files (e.g. image band files, PCD file, calibration file) to disk.

DES : Read these files and extract the appropriate scene data

DES : Converts the extracted data from HDF EOS Format to HDF Format

DES : Write scene data to an LORwrs output tape.

DES : Update work order database table w/ a list of files on the tape and level 1 processing parameters

DES : If this is a request for L0R data prompt operator to load 8mm tape else update dbase record for data xfer to the IAS OR LPGS

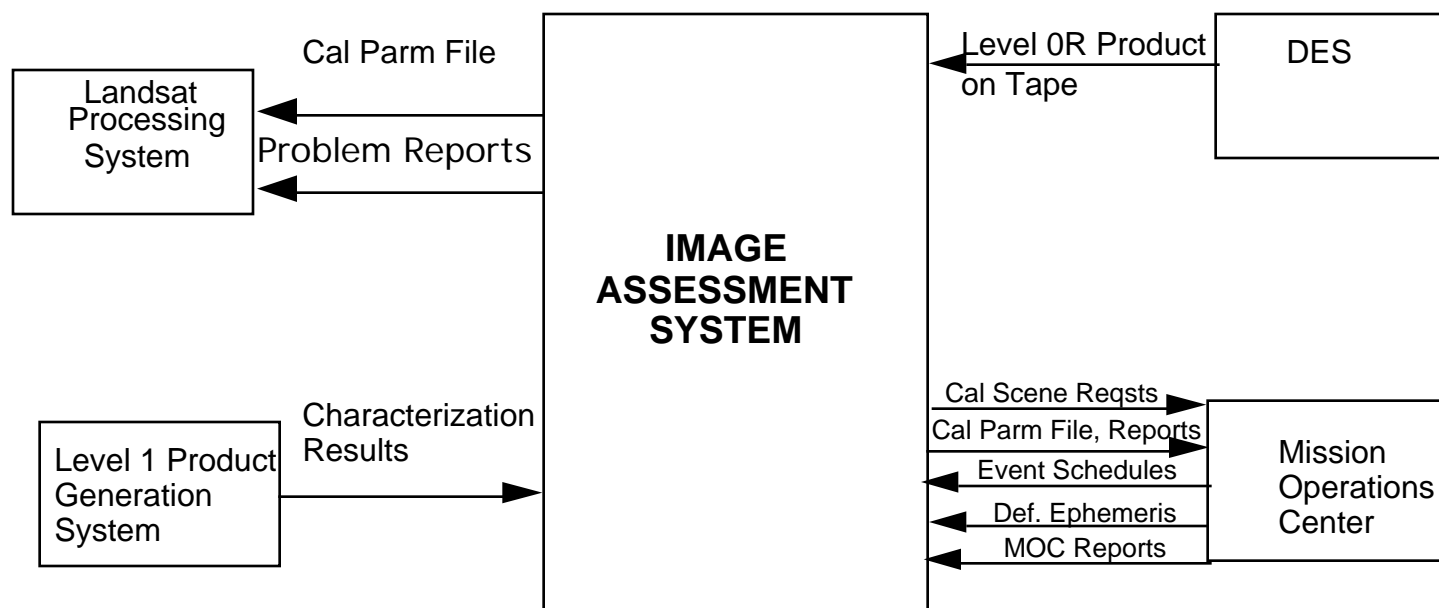


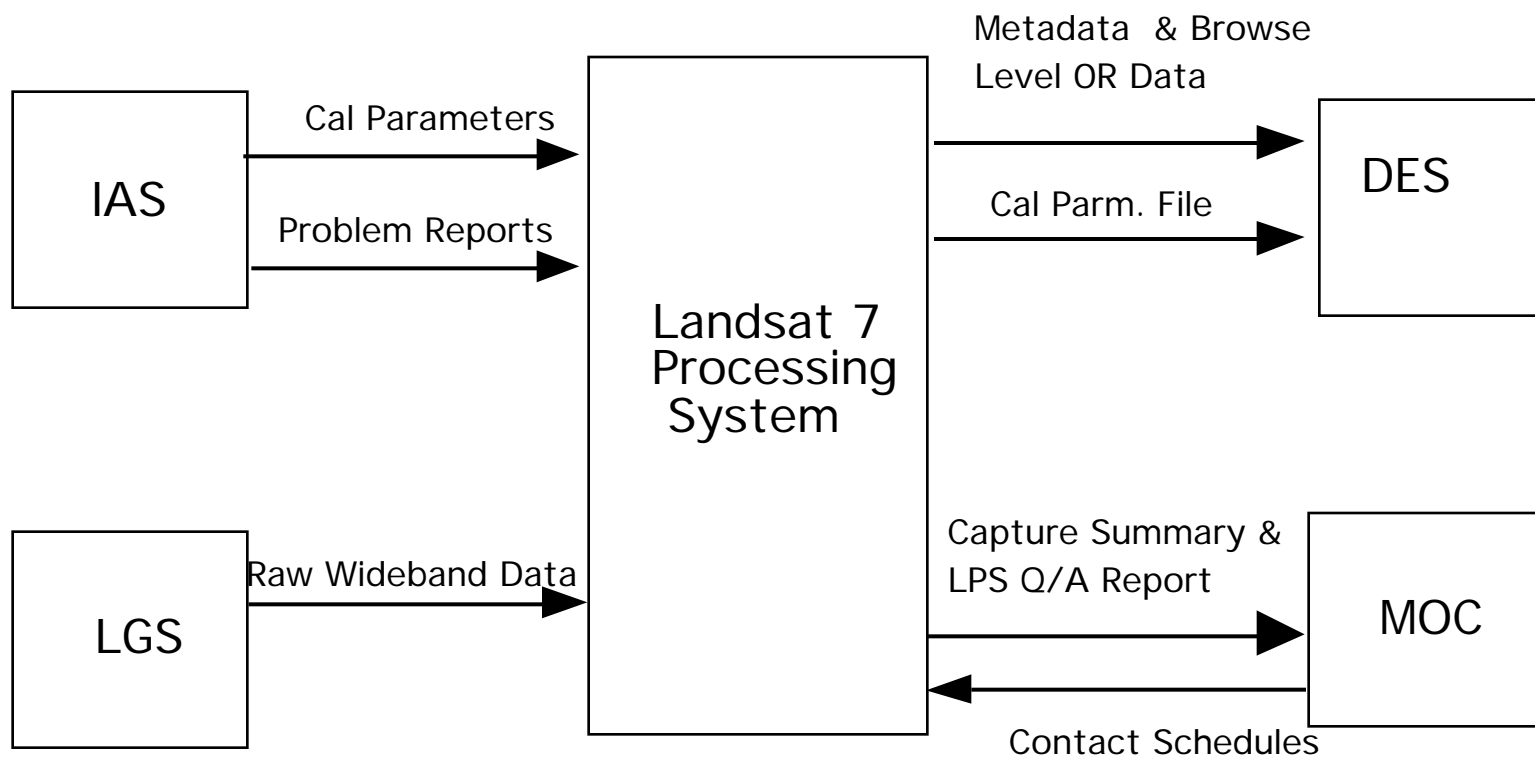
IAS or LPGS to load L0Rwrs file and produce L1 Files

IAS or LPGS : Poll DBASE for next work order
IAS or LPGS : Upon receiving work order initiate copying L0R data
IAS or LPGS : Processes files to L1R or L1G format
IAS or LPGS : Prompt operator to load 8mm
Operator : Load 8mm and enter inventory number
IAS or LPGS : Write HDF Files to 8mm
Operator : Package tape for shipment



IAS Context Diagram to interface with DES







System Design Functional Break Down



LPS, IAS, and LPGS Changes

LPS Changes to support the DES

IAS Changes to support the DES

LPGS Changes to support the DES

DES Operations Concept

DES User Interface

DES Operator Interface

DES Process Metadata File

DES Ingest D3 tapes



LPS Changes to support the DES

- **Must support the creation of DES transfer tapes**
- **Must support the electronic transfer of the metadata and browse files to DES**
- **Must inform DES when a DES tape is available**
- **Bind Cal. Parm. File to each subinterval**



IAS Changes to support the DES

- **Poll the shared database for available L0R data from DES**
- **Update the shared database with status, i.e. data pulled**
- **Issue an IAS work order and process the data**
- **Create an output tape containing the Level 1 product**
- **Update the shared database with status , i.e. data shipped**



LPGS Changes to support the DES

- **Poll the shared database for available L0R data**
- **Use FTP to transfer L0R data from DES to LPGS**
- **Issue an LPGS work order and process the data**
- **Create an output tape containing the Level 1 product**
- **Update the shared database**

**DES User Interface**

- Facilitate data queries based on WRS path and row, scene acquisition time, cloud coverage assessment (TBD), and scene quality
- Allow user to select and display a browse file
- Allow the user select level 0R or level 1 processing
- Allow user to specify the following level 1 processing options with a WRS scene request:
 - 1. Map Projections (1 of 7 maps)
 - 2. Resampling Methods (1 of 3 methods)
 - 3. Orientation (1 of 2)
 - 4. Bands (From 1 to 8 in any combination)
 - 5. Product Choice (1 of 3 product types)
 - 6. Corrective Parameter Source (1 of 2)
 - 7. Grid Cell Size (Variable)
- Allow user to place an WRS Scene Request



DES Operator Interface

- **Facilitate the capability to Query and display the WRS Scene Request Status**
- **Allow the operator to respond to tape mount and dismount request**
- **Allow operator to start the WRS Scene Request process**
- **Display Processing Messages**



Process the Metadata File

- Read the metadata file and extract information for a metadata database entry
- Create metadata database entry from the extracted information containing at least the following data items:
 - Data Format Type
 - Time information
 - WRS information
 - Cloud Cover Assessment
 - Contact information
 - Source information
 - Tape inventory numbers
 - Browse file names
 - Band file names
 - Calibration File name
 - Metadata File name
 - PCD file name
 - MSCD file name
 - Cal. Param. file name



Ingest DES D3 Tapes

- Get next WRS L0R scene request from database
- Request the DES data tapes
- Extract the subinterval data files and the other support data files from the requested tape and save them to disk
- Read the subinterval (Band) data files and extract the requested WRS scene
- Convert the WRS scene data from HDF EOS format to HDF Format
- Read the other data (Calibration Parameter, Cal, MSCD, Metadata) files and extract the supporting scene data
- Load PCD data on a subinterval basis
- Create the DES output files
- Inform the level 1 processing facility that the DES output files are ready
- Create a WRS Level Zero R Tape and shipping data when requested by user



Implementation Thoughts



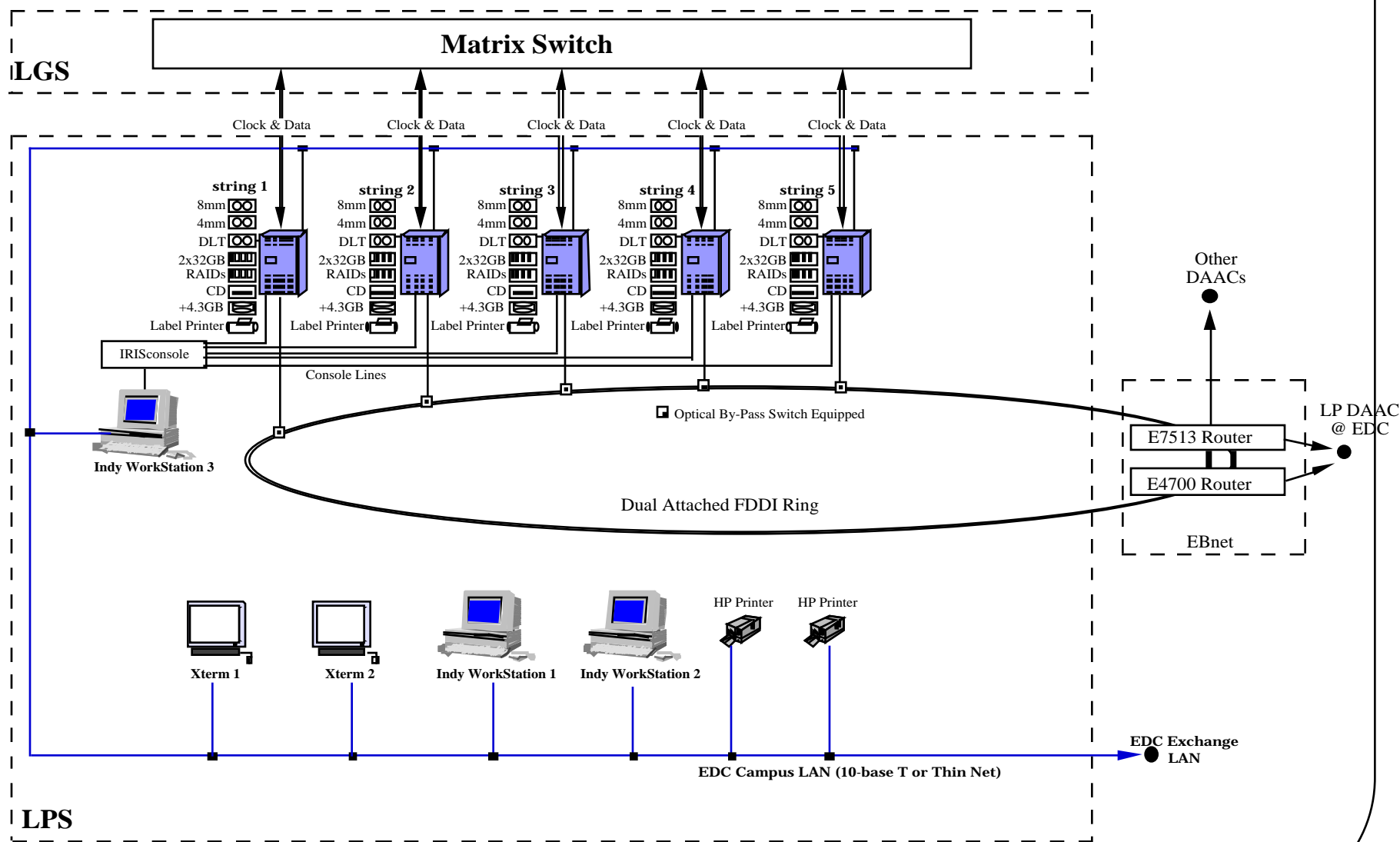
- **Instead of changing Level 3 Requirements and Operations Concepts documents, each system: LPS, IAS, and LPGS will write a DES Augmentation Requirements and Operations Concept Document that will encapsulate new requirements and operations concepts.**
- **Regarding Traceability: A memo from the projects, ESDIS and L 7, could be traced to by the level 3 requirements.**



H/W Diag. for LPS, IAS, and LPGS for Reference



Landsat Processing System (LPS)



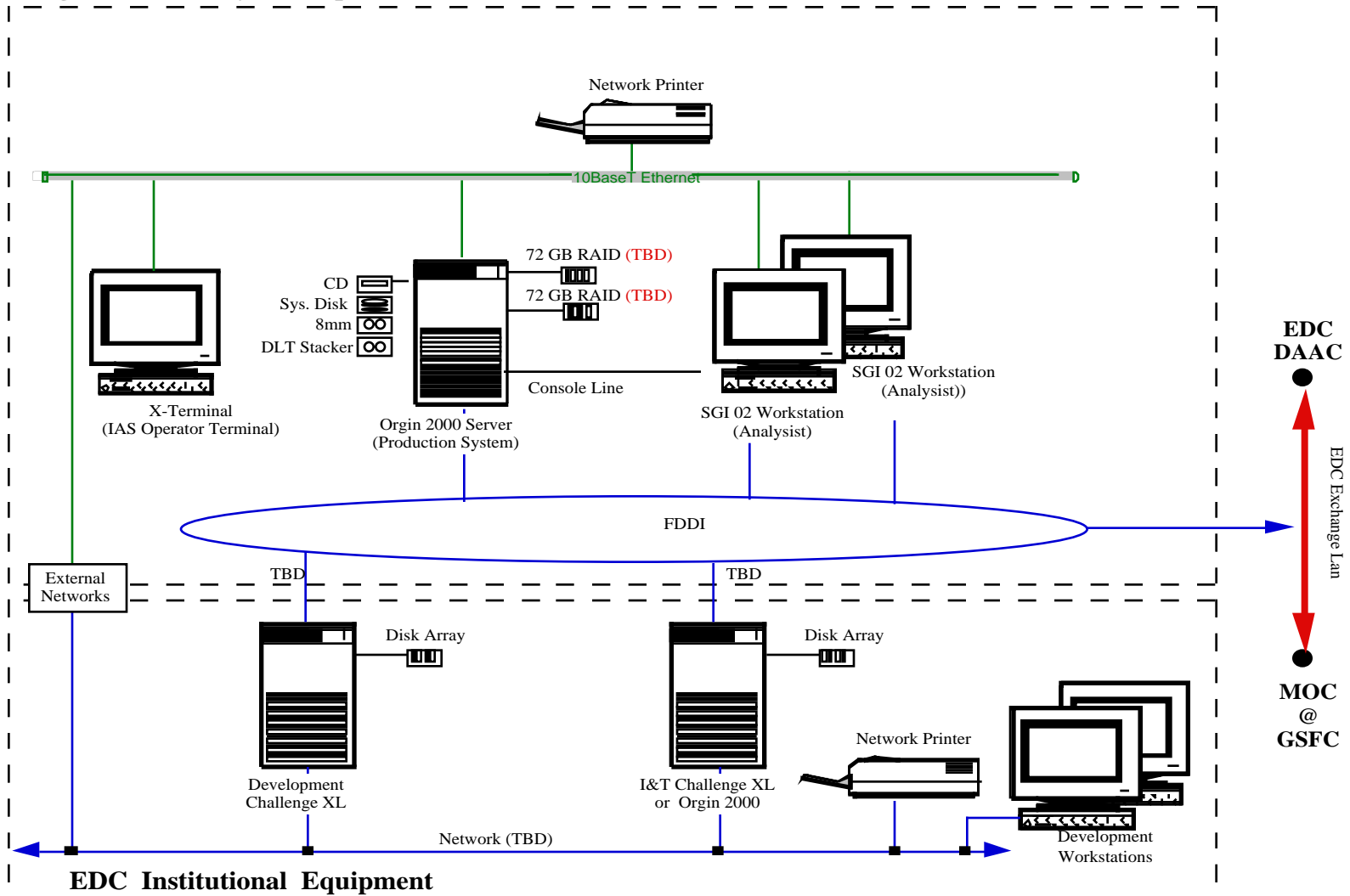
R. Schweiss 6/19/96

Operational Hardware Configuration



Image Assessment System (IAS)

Image Assessment System Operational Hardware Architecture



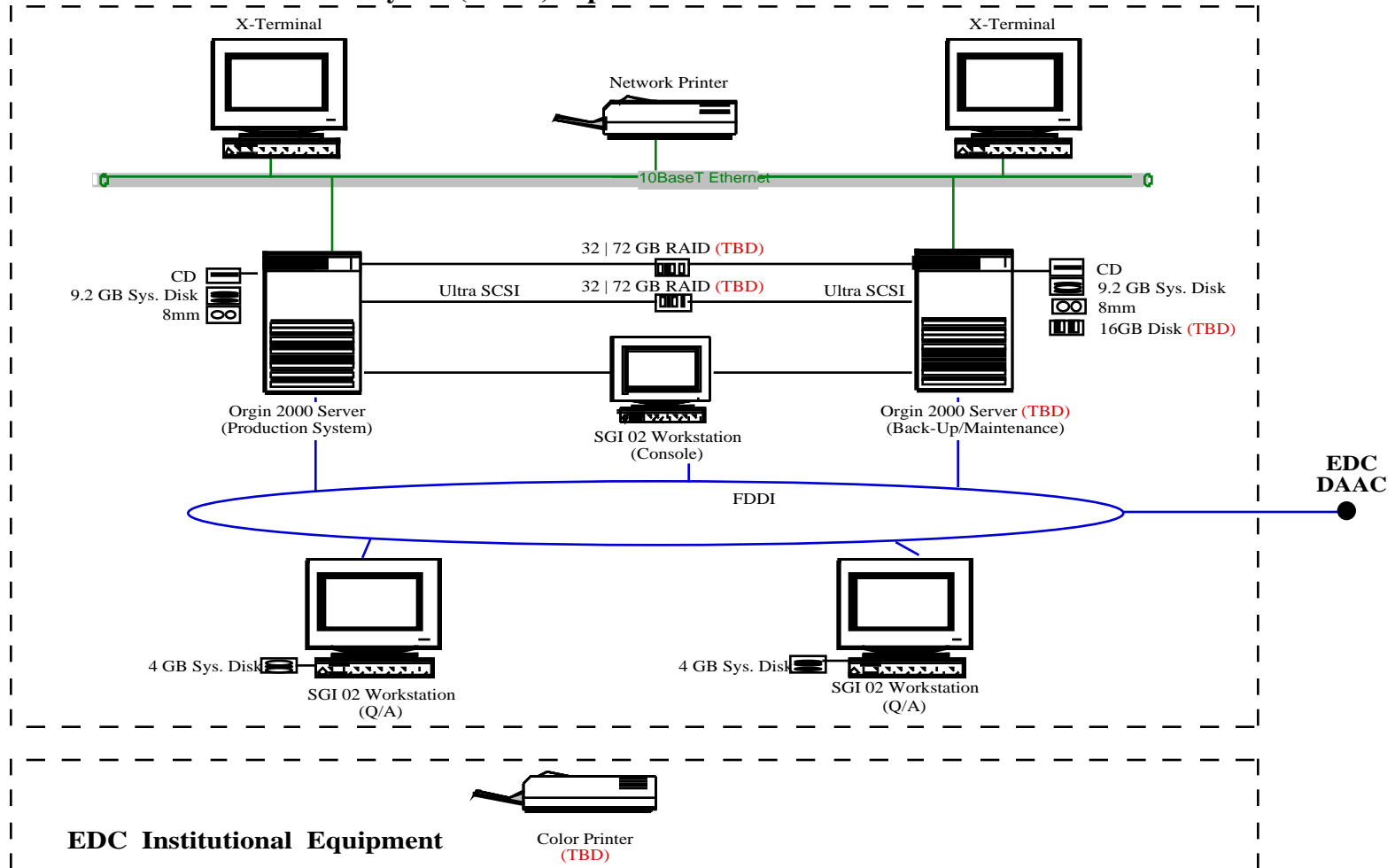
Schweiss 3/10/97 (Identical to 12/05/96 PDR; Redrawn for readability and consistency)

QMM 2 DAAC Emergency System Presentation

Level 1 Product Generation System (LPGS)



Level 1 Product Generation System(LPGS) Operational Hardware Archecture



Dunham,Schweiss February 10, 1997